CLAIMS

1. An optical waveguide device, comprising at least one Y-junction integrated on a planar substrate, said junction comprising:

a first, a second and a third optical waveguide extending on said substrate,

a transition portion in which said second and third waveguides branch from said first waveguide, comprising a bifurcation discontinuity of predetermined width,

wherein essentially at the position of said bifurcation discontinuity, the width of said first waveguide is less than the sum of widths of said second waveguide, said third waveguide and said bifurcation discontinuity, and

said first optical waveguide extends into said transition portion up to said bifurcation discontinuity with its width essentially unchanged.

2. The device according to Claim 1, wherein the width of said bifurcation discontinuity is greater than 0.2 μm.

3. The device according to Claim 1, wherein said transition portion comprises a separation region between said second and third waveguides, said separation region having a refractive index lower than the refractive index of said second and third waveguides.

4. The device according to Claim 3, wherein the width of said separation region is essentially constant throughout the transition portion.

5. The device according to Claim 3, wherein the width of said separation region increases progressively away from said first waveguide.

6. The device according to Claim 1, wherein the width of said second and third waveguides increases progressively in said transition portion away from said first waveguide.

7. The device according to Claim 6, wherein the sum of the widths of said second and third waveguides and the bifurcation discontinuity exceeds the width of said first

waveguide at said bifurcation discontinuity by a quantity in the range from approximately 10% to 50%.

8. The device according to Claim 7, wherein the sum of the widths of said second and third waveguides and the bifurcation discontinuity exceeds the width of said first waveguide at said bifurcation discontinuity by a quantity in the range from approximately 15% to 35%.

9. The device according to Claim 1, wherein said first, second and third waveguides are adapted to allow the propagation of a single mode of a radiation of predetermined wavelength.

10. The device according to Claim 1, wherein said second and third waveguides branch from said first waveguide in an essentially symmetrical way.

11. The device according to claim 1, wherein said planar substrate is made from lithium niobate.

12. A method for forming an integrated optical waveguide device, comprising the steps of:

providing a planar substrate of a first material having a refractive index;

integrating a waveguide structure in at least one portion of said substrate by using a second material, said second material being capable of increasing said refractive index in said at least one portion of said substrate;

said step of integrating comprising a step of providing, in a mask, at least one region of said mask which is transparent to an exposure of radiation of predetermined wavelength, said transparent region delimiting a structure essentially corresponding to the said waveguide structure, and

said waveguide structure comprising at least one Y-shaped portion having an input waveguide, a transition portion and two output waveguides, said transition portion

comprising a truncation of predetermined width of the bifurcation of said output waveguides from said input waveguide;

wherein said step of providing at least one transparent region in the said mask comprises

providing in the transition portion a discontinuity of a selected width essentially at the position of said truncation, such that the sum of the widths of said output waveguides and of said truncation is greater than the width of said input waveguide, and

providing said input waveguide in such a way that it extends into the said transition portion up to said truncation while keeping its width essentially unchanged.

13. A method according to Claim 12, wherein said step of integrating comprises the additional steps of:

depositing a first layer of said second material;

depositing a second layer of a photosensitive material;

facing the mask to said second layer;

exposing said mask to said exposure radiation, modifying the second layer in such a way as to mark out a profile of the waveguide structure to be integrated; and

eliminating a portion of said second material outside said profile.

14. The method according to Claim 13, wherein said step of integrating additionally comprises, after said step of eliminating, the step of:

diffusing said second material into said substrate at a predetermined temperature.

15. The method according to Claim 14, wherein said temperature is in the range from approximately 900°C to 1150°C.

16. The method according to Claim 12, wherein said first material is lithium niobate.

17. The method according to Claim 12, wherein said second material is titanium.

18. The method according to Claim 13, wherein the thickness of said first layer of material is less than approximately 500 nm.

19. The method according to Claim 18, wherein said thickness is in the range from 50 nm to 150 nm.

20. A mask for forming an optical waveguide device, comprising

at least one region transparent to an exposure radiation of predetermined wavelength, said transparent region delimiting a structure which essentially corresponds to a waveguide structure to be integrated on a planar substrate,

said waveguide structure comprising at least one Y-shaped portion having an input waveguide, a transition portion and two output waveguides,

said transition portion comprising a truncation of predetermined width of the bifurcation of said output waveguides from said input waveguide,

wherein, in said transition portion, is a discontinuity of selected width essentially at the position of said truncation, such that the sum of the widths of the said output waveguides and of said truncation is greater than the width of said input waveguides, and

said input waveguide extends into said transition portion up to said truncation with its width essentially unchanged.

21. The mask according to Claim 20, wherein in said transition portion, a separation region between said output waveguides has a width at least equal to the width of said truncation.

22. The mask according to Claim 21, wherein the width of said separation region is essentially constant throughout the transition portion.

23. The mask according to Claim 21, wherein the width of said separation region increases progressively away from said first waveguide.

24. The mask according to Claim 20, wherein the sum of the widths of said output waveguides and of said truncation exceeds the width of said input waveguide at said bifurcation by a quantity in the range from 10% to 50%.

25. The mask according to Claim 24, wherein the sum of the widths of said output waveguides and of said truncation exceeds the width of said input waveguide at said bifurcation by a quantity in the range from 15% to 35%.

26. The mask according to Claim 20, wherein the width of said truncation is greater than 0.2 μm.